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Pre-Travel Health Care of Immigrants Returning Home to Visit Friends and Relatives

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Abstract. Immigrants returning home to visit friends and relatives (VFR travelers) are at higher risk of travel-associated illness than other international travelers. We evaluated 3,707 VFR and 17,507 non-VFR travelers seen for pre-travel consultation in Global TravEpiNet during 2009–2011; all were traveling to resource-poor destinations. VFR travelers more commonly visited urban destinations than non-VFR travelers (42% versus 30%, $P < 0.0001$); 54% of VFR travelers were female, and 18% of VFR travelers were under 6 years old. VFR travelers sought health advice closer to their departure than non-VFR travelers (median days before departure was 17 versus 26, $P < 0.0001$). In multivariable analysis, being a VFR traveler was an independent predictor of declining a recommended vaccine. Missed opportunities for vaccination could be addressed by improving the timing of pre-travel health care and increasing the acceptance of vaccines. Making pre-travel health care available in primary care settings may be one step to this goal.

INTRODUCTION

Approximately 12% of the United States population are foreign-born, and another 11% are native-born with at least one foreign-born parent.¹ Members of this immigrant population who are traveling home to visit friends or relatives in lower-income countries (VFR travelers) are at higher risk of travel-related infectious diseases than the general population of international travelers.^{2,3} In US surveillance data from 2010, 71% of imported malaria cases in travelers with an identified purpose of travel were VFR travelers.⁴ These VFR travelers with malaria were significantly less likely to have taken chemoprophylaxis than individuals traveling for other purposes. As with malaria, the majority of travel-associated typhoid fever cases in the United States in 1999–2006 also occurred in VFR travelers.⁵ Enteric (typhoid and paratyphoid) fever was the most common vaccine-preventable disease among ill returned travelers seen over a decade by the GeoSentinel Surveillance Network.⁶ VFR travel, particularly to South Central Asia, was an independent risk factor for enteric fever in this population. Other infectious diseases, including hepatitis A, measles, tuberculosis, and others, are also more common in VFR travelers.^{6–9}

There are multiple potential reasons for the increased risk of travel-related illness in VFR travelers, including lower socioeconomic status, language barriers, behavioral differences while traveling, and presumption of immunity to infections found at the travel destinations. Disease prevention strategies for VFR travelers are a public health priority and are aimed at decreasing the burden of illness in this population as well as at curbing the global spread of infectious diseases.^{10,11} Primary care practitioners are the most common source of pre-travel health advice for VFR travelers,¹² although airport surveys of departing travelers have repeatedly shown that many VFR travelers do not seek pre-travel health advice.^{12–14}

Here, we evaluate a large cohort of VFR travelers who obtained pre-travel health advice within Global TravEpiNet, a consortium of US practices that provide care to international travelers. Our goal was to better understand the demographics, itineraries, and pre-travel health care of VFR travelers who sought pre-travel health advice and identify areas in which the care of this population could be improved.

METHODS

Global TravEpiNet clinics. Global TravEpiNet is a consortium of US practices that is sponsored by the Centers for Disease Control and Prevention (CDC) as previously described.¹⁵ Global TravEpiNet sites are distributed across the United States and include academic practices, health care consortia, health maintenance organizations, pharmacy-based clinics, private practices, and public health clinics. An institutional review board at each participating site reviewed and approved the study.

Study population. Clinicians collected data on all individuals seen for pre-travel consultation at participating sites from January of 2009 to December of 2011 using a secure internet tool. For each unique clinic visit, travelers provided details about their medical history, itinerary, and travel purpose. Clinicians verified the information provided by travelers and entered additional data on immunization history, health advice provided, vaccines administered, and medications prescribed during the pre-travel encounter. If a traveler had an indication for a vaccine according to CDC guidelines that were current at the time of the clinic visit, but the vaccine was not administered, the clinician was required to provide a reason for not administering the vaccine; available options included pre-existing immunity, vaccine not indicated, referred to primary care provider for vaccination, patient declined, medical contraindication, insufficient time, or vaccine not available.

Data analysis. Geographic destinations were classified into regions according to the grouping of member states of the World Health Organization (WHO) (<http://www.who.int/about/regions/en/index.html>) and income categories (low income, lower middle income, upper middle income, or high income)

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according to the 2009 World Bank World Development Report (<http://econ.worldbank.org>).¹⁶ For purposes of analysis, we considered travel to low- or lower middle-income (LLMI) countries to be highest risk, and travelers to these two destination categories were considered together. Countries with risk of malaria or yellow fever transmission were defined in accordance with the CDC categorization for the time period of the study.^{2,17} We accounted for the revised yellow fever vaccine recommendations for those individuals traveling after April 1, 2011 in our definition of destinations requiring yellow fever vaccine.²

Travelers selected one or more of the following purposes for their trip: leisure, business, returning to region of origin of self or family to visit friends and relatives, adoption, providing medical care, receiving medical care, research/education, non-medical service work, missionary work, military service, adventuring, attending large gathering or event, or other activities. Travelers also provided information regarding the planned accommodations for their trip. In accordance with the CDC definition of the term,² we defined a VFR traveler as an individual who was traveling to an LLMI country and who (1) selected “traveling to region of origin of self or family to visit friends or relatives” as their purpose of travel or (2) stated that they would be pursuing a home stay with relatives on their trip. For the present analysis, we compare VFR travelers with travelers to LLMI countries who were traveling for other purposes.

Data analyses were performed using Stata 12.0 (StataCorp, College Station, TX) and Excel 2003 (Microsoft Corporation, Redmond, WA). We used Kruskal–Wallis equality of proportions test, Somers’ *D* test, and separate random intercept logistic regressions with clinical site as the random effect to evaluate measures of association and statistical significance in the data. We also performed multivariable logistic regression analyses to examine the effect of individual variables on the likelihood of declining a vaccine using random effects estimation to account for variances by clinical site. We analyzed the following variables in the logistic regression: traveler’s age (≥ 18 versus < 18 years), duration of travel (> 28 versus ≤ 28 days), sex, region of birth, number of medical concerns (≥ 2 versus < 2), region of destination, reason for visiting the clinic, and purpose of travel. For analyzing vaccine declinations, we compared travelers who received the vaccine in association with the clinic visit with those travelers who declined to be vaccinated.

RESULTS

We included 3,707 VFR and 17,507 non-VFR travelers in our analysis; all were traveling to an LLMI country as defined by the World Bank. Females comprised a slight majority (54%) of both VFR and non-VFR travelers seen at Global TravEpiNet sites. VFR travelers were significantly younger than non-VFR travelers (median age = 30 years versus 37 years, $P < 0.001$); 18% of VFR travelers were younger than 6 years of age (Table 1), whereas $< 1\%$ of non-VFR travelers were in this age category. VFR travelers pursued trips of longer duration than non-VFR travelers (median duration = 25 days versus 14 days, $P < 0.001$) and were more likely to visit only urban areas (42% versus 30%, $P < 0.0001$) (Table 1). Among travelers to Africa, VFR travelers were particularly likely to visit only urban areas (42% of VFR travelers versus 19% of non-VFR travelers to the WHO African region, $P <$

TABLE 1
Demographic and travel-related characteristics of VFR travelers compared with non-VFR travelers at Global TravEpiNet from January of 2009 to December of 2011

	VFR	Non-VFR	<i>P</i> value*
Number	3,707	17,507	
Age (years)			
< 1	107 (2.9%)	7 (< 0.1%)	0.001
1–5	556 (15.0%)	83 (0.5%)	0.001
6–17	550 (14.8%)	784 (4.5%)	0.001
18–49	1,820 (49.1%)	11,080 (63.3%)	0.001
50–64	498 (13.4%)	3,822 (21.8%)	0.001
> 65	176 (4.8%)	1,731 (9.9%)	0.001
Sex (female)	2,002 (54.0%)	9,519 (54.3%)	0.86
Travel duration			
1–7 days	108 (2.9%)	2,320 (13.3%)	< 0.0001
8–14 days	747 (20.1%)	7,150 (40.8%)	< 0.0001
15–28 days	1,165 (31.4%)	5,011 (28.6%)	< 0.0001
29–180 days	1,545 (41.7%)	2,488 (14.2%)	< 0.0001
> 6 months	136 (3.7%)	526 (3.0%)	< 0.0001
Type of destination			
Urban only	1,542 (41.6%)	5,116 (29.2%)	< 0.0001
Rural only	136 (3.7%)	1,847 (10.6%)	< 0.0001
Both	2,015 (54.4%)	10,530 (60.2%)	< 0.0001
Neither	14 (0.4%)	14 (0.1%)	< 0.0001
Days to departure (median, IQR)	17 (8–33)	26 (12–46)	0.0001
Top five destination countries			
India (18.1%)		India (17.9%)	
Ghana (8.3%)		China (10.5%)	
Ethiopia (6.0%)		Thailand (9.3%)	
Nigeria (5.9%)		Kenya (8.4%)	
Vietnam (5.6%)		Tanzania (8.3%)	

*Based on Kruskal–Wallis equality-of-proportions test or Somers’ *D* test as appropriate, adjusted for clustering among clinical sites.

0.01). VFR travelers also sought pre-travel health care closer to their departure date than non-VFR travelers (median = 17 days versus 26 days prior to departure, $P < 0.001$) (Table 1).

Overall, VFR travelers were more likely than non-VFR travelers to visit countries with regions endemic for malaria or yellow fever. For VFR travelers, the most frequently visited regions were the WHO regions of Africa (46%), Southeast Asia (26%), and the Western Pacific (18%). For non-VFR travelers to LLMI countries, Africa (31%), Southeast Asia (30%), and the Western Pacific (22%) were also the most

TABLE 2
Medical conditions of VFR travelers compared with non-VFR travelers at Global TravEpiNet from January of 2009 to December of 2011

Medical condition	VFR <i>N</i> (%)	Non-VFR <i>N</i> (%)	<i>P</i> value*
Any medical condition	2,204 (54.6)	10,683 (61.0)	< 0.001
Seasonal allergies	987 (26.6)	5,630 (32.2)	< 0.001
Heart/cardiovascular	528 (14.2)	3,218 (18.4)	< 0.001
Neurological/psychiatric	222 (6.0)	1,759 (10.1)	< 0.001
Lung	326 (8.8)	1,382 (7.9)	0.24
Cancer or blood disorder	182 (4.9)	1,252 (7.2)	< 0.001
Endocrine disorder	259 (7.0)	1,334 (7.6)	0.45
Diabetes	121 (3.3)	347 (2.0)	< 0.001
Intestinal system	173 (4.7)	1,137 (6.5)	< 0.001
Dermatologic	218 (5.9)	1,091 (6.2)	0.29
Joint	165 (4.5)	995 (5.7)	0.001
Immune system	132 (3.6)	392 (2.8)	0.005
Obstetric/gynecologic	128 (6.4)	424 (4.5)	0.043
Pregnant/breastfeeding	45 (2.3)	65 (0.7)	< 0.001
Kidney	74 (2.0)	289 (1.7)	0.17
Liver	83 (2.2)	192 (1.1)	< 0.001

*Based on random intercept logistic regression models with clinical site as the random effect.

TABLE 3

Malaria chemoprophylaxis in VFR travelers compared with non-VFR travelers traveling to countries that include regions endemic for malaria

	VFR <i>N</i> (%)	Non-VFR <i>N</i> (%)	<i>P</i> value
Antimalarial (any)	2,724 (74.7)*	12,172 (72.0)†	< 0.0001
Atovaquone/proguanil	1,260 (34.8)	9,325 (55.6)	
Mefloquine	1,092 (30.2)	606 (3.6)	
Chloroquine	115 (3.2)	1,108 (6.6)	
Doxycycline	192 (5.0)	838 (5.0)	
Primaquine	0 (0)	5 (< 0.1)	

*Sixty-five travelers received more than one prescription or could not be classified.

†Two hundred ninety travelers received more than one prescription or could not be classified.

commonly visited regions. India, Ghana, Ethiopia, Nigeria, and Vietnam were the most common destination countries for VFR travelers; aside from India, none of these countries were among the top destinations of non-VFR travelers (Table 1). VFR travel took place most frequently (29% of trips) in the summer months of the northern hemisphere.

VFR travelers had fewer existing medical condition than non-VFR travelers (Table 2). The types of medical conditions also differed between VFR and non-VFR travelers. In particular, VFR travelers were more likely to be pregnant or breastfeeding, and diabetes and immune system disorders were more common in VFR travelers than non-VFR travelers. VFR travelers were less likely to report a neuropsychiatric condition than non-VFR travelers. On average, VFR travelers were taking fewer medications than non-VFR travelers (VFR median = 0, interquartile range [IQR] = 0–1; non-VFR median = 1, IQR = 0–2; $P < 0.001$).

We evaluated the malaria chemoprophylaxis agent that was prescribed to travelers going to countries with regions that are endemic for malaria (Table 3). Atovaquone/proguanil was the most commonly prescribed chemoprophylaxis agent for both VFR and non-VFR travelers; however, a much higher proportion of VFR travelers than non-VFR travelers received mefloquine (30.2% versus 3.6%; $P < 0.001$). VFR travelers more commonly received mefloquine than non-VFR trav-

elers when traveling for 28 days or fewer (17.5% versus 2.5%; $P < 0.001$) and when traveling for 7 days or fewer (12.7% versus 1.6%; $P < 0.001$). VFR travelers were less likely than non-VFR travelers to receive prescription antibiotics for travelers' diarrhea (72.6% versus 91.4%; $P < 0.001$).

VFR travelers were more likely than non-VFR travelers to have existing immunity to hepatitis A at the time of their pre-travel consultation (47% versus 40%; $P < 0.001$). Typhoid, hepatitis A, and yellow fever were the three most frequently administered vaccines among VFR travelers and non-VFR travelers alike (administered to 74%, 41%, and 34% of VFR travelers, respectively, and 76%, 55%, and 26% of non-VFR travelers, respectively).

Clinicians were required to provide a reason when vaccines were not administered to travelers to whom they would be otherwise indicated by the current CDC guidelines at the time of the visit. In most (95%) cases, declination by the traveler was cited as the reason for not administering a vaccine. Referral to another provider, medical contraindication, insufficient time to complete the vaccine series before departure, and lack of availability of vaccine were other reasons that were cited less frequently (< 5%). We performed a multivariable analysis to identify predictors of declining any recommended vaccine in the study population. Being a VFR traveler (odds ratio [OR] = 1.30, 95% confidence interval [CI] = 1.15–1.48), traveling for > 28 days (OR = 1.72, 95% CI = 1.56–1.89), traveling to the WHO African region (OR = 1.21, 95% CI = 1.08–1.35), being an adult (OR = 1.54, 95% CI = 1.32–1.78), and having fewer than two medical concerns (OR = 1.23, 95% CI = 1.13–1.34) were each independently associated with declining a recommended vaccine. In particular, 10% of VFR travelers traveling to yellow fever-endemic countries who were offered the yellow fever vaccine declined it, and 85% of VFR travelers who were offered rabies vaccine declined it (Figure 1). In contrast, 4% of non-VFR travelers visiting yellow fever-endemic countries who were offered the yellow fever vaccine declined it, and 59% of non-VFR travelers who were offered rabies vaccine declined it.

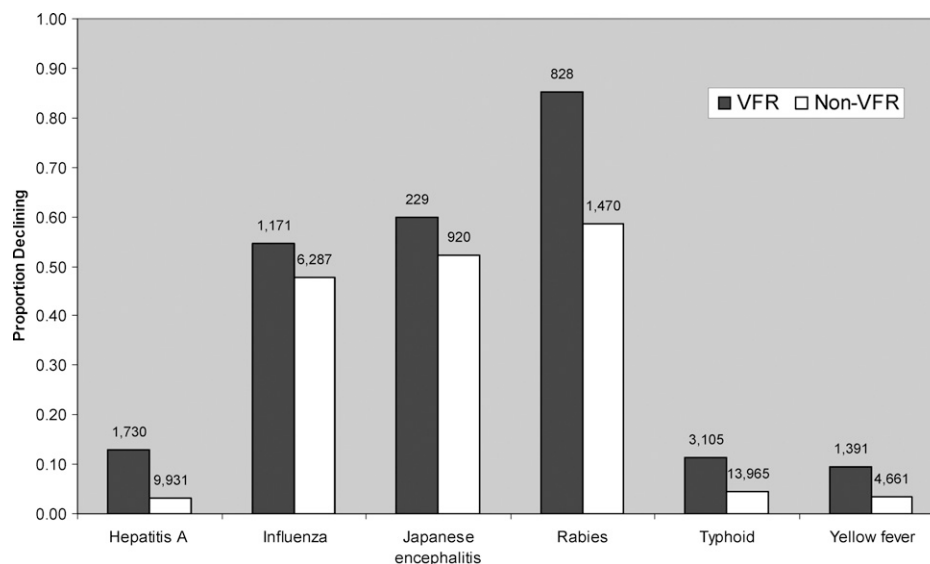


FIGURE 1. Proportion of VFR travelers and non-VFR travelers declining selected indicated vaccines at Global TravEpiNet from January of 2009 to December of 2011. The total number of individuals who were administered or declined the vaccine is shown above each column.

DISCUSSION

According to the US Office of Travel and Tourism Industries, 35% of US overseas travelers in 2010 (approximately 10 million travelers) reported visiting friends and relatives as the main purpose of their trip. VFR travelers have repeatedly been identified as a group at higher risk of travel-associated illness,^{3,7} and prevention strategies targeted at this population are a public health priority.¹⁰ Knowledge about existing health conditions, planned itineraries, and pre-travel health care of this large traveling population has been limited to date.

We identified a number of epidemiologically important characteristics of VFR travelers seen at Global TravEpiNet sites. Slightly more female VFR travelers than male VFR travelers were seen for pre-travel health advice. This finding may relate to the fact that women are more likely than men to pursue pre-travel health advice.¹⁸ Alternatively, women might, in fact, comprise a majority of VFR travelers. Data from the Office of Travel and Tourism Industries from 2010 indicate that 54% of all US leisure and VFR travelers in 2010 were female¹⁹—similar to the proportion identified in Global TravEpiNet. VFR travelers were also significantly younger than non-VFR travelers. In particular, 33% of VFR travelers seen at Global TravEpiNet sites were children, and 18% were children under the age of 6 years. In contrast, children comprised only 8% of all US international travelers in 2010.¹⁹ Ease of travel and increased global migration, with a consequent desire to bring children to visit relatives, are likely important reasons why children comprise such a high proportion of VFR travelers. Recent data from the GeoSentinel Network indicate that children are at higher risk of complications from illness acquired while traveling. In an analysis of 10 years of data, 14% of children with travel-related illness required hospitalization compared with 10% of adults.²⁰

In addition to age and sex, there were other important distinctions in itinerary and pre-travel health care between VFR and non-VFR travelers in this study. VFR travelers pursued trips of significantly longer duration, with the majority of itineraries being 1 month or longer. Long-term travel is associated with a unique profile of health risks, including vector-borne illness, contact-transmitted diseases, and psychological problems.²¹ Importantly, VFR travelers sought pre-travel health advice closer to their departure date than non-VFR travelers—a factor that can limit the ability to complete needed vaccine series. VFR travelers, particularly travelers to the WHO African region, also visited urban destinations more frequently than non-VFR travelers. Patterns of disease risk, including vector-borne disease, zoonotic disease, and trauma, may differ between urban and rural areas, and this finding should be considered during pre-travel counseling.

The itineraries of VFR travelers frequently included areas endemic for malaria, with countries in the WHO African region representing almost one-half of all destinations of VFR travelers. In 2010, 65% of imported malaria cases in the United States with a known region of acquisition were acquired in Africa.⁴ Lack of malaria chemoprophylaxis or non-adherence to a prescribed prophylactic was common among these imported malaria case patients. By definition, travelers in this cohort all sought pre-travel health care and were offered malaria chemoprophylaxis based on their itinerary. Notably, mefloquine was disproportionately prescribed to VFR travelers compared with non-VFR travelers,

regardless of duration of travel. Although less costly, mefloquine has higher rates of gastrointestinal and neuropsychiatric adverse effects compared with other chemoprophylaxis agents,²² particularly among women.²³ Identifying optimal strategies for chemoprophylaxis uptake and compliance among VFR travelers, particularly those travelers visiting Africa, is a priority.

Declining recommended vaccines was remarkably common among VFR travelers in this cohort, especially considering that these individuals had sought pre-travel health care. Travelers visiting Africa were particularly likely to decline a recommended vaccine. Declination of recommended vaccines among VFR travelers may relate to cost, concerns about vaccine safety, delayed timing of the pre-travel visit, or lack of perceived risk. Our results indicate that strategies to improve travel vaccine uptake in the VFR population, even among those travelers who seek pre-travel health care, are needed.

An important limitation of our study is that VFR travelers, in general, infrequently seek specialized pre-travel health advice¹²; travelers seen at Global TravEpiNet sites may, therefore, differ from the overall population of VFR travelers. Nevertheless, even within the population seeking specialized pre-travel care, we were able to identify relevant characteristics of VFR travelers that may affect health outcomes and are appropriate targets for public health interventions. In particular, outreach targeted at women and children, who comprise a substantial proportion of VFR travelers, is needed. Our data suggest that missed opportunities for vaccination in VFR travelers can be addressed by improving the timing of pre-travel health care and increasing the acceptance of recommended vaccines. Making pre-travel health care available in more affordable and accessible primary care settings may be one important step to this goal; our findings, in conjunction with geographic data from the US census, could help target these efforts to appropriate immigrant communities.

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